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Impact of Moisture on Laser Tissue Welding with Solid Albumin Solders

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Purpose. Correlation between the solubility of solid albumin solders and their laser weld strength was investigated. ***Methods.*** Sections of dog intestine were welded with solid albumin strips by a GaAlAs diode laser (λ = 810 nm). The strips were either soluble (A) or insoluble (B). Two different treatments were followed for tissue soldering: "wet weld" (n = 60) and "dry weld" (n = 60). These treatments were chosen to assess the impact of moisture on the repair strength. Laser power and radiation dose were 0.14 W and 14 J/mg respectively. "Dry" and "wet" solders were scanned by a heat flux differential calorimeter (DSC) to measure their denaturation temperatures. A water solution of BSA (50% w/w) was also scanned by DSC. ***Results.*** Repair strength of soluble solder was significantly stronger than the repair strength of insoluble solder in "wet" conditions (23.1 ± 6.9 and 6.1 ± 4.3 gmf, Anova $p<0.05$). A and B solders did not denature if dry, while their denaturation temperatures were 72.7 ± 1.0 and 69.7 ± 1.0 ^{0}C respectively after hydration ("wet"). Fluid solder (50%) denatured at 73.0 ± 1.0 ^{0}C. ***Conclusions.*** Soluble solid solder behaved like a concentrated fluid solder at the tissue interface. Hence the interface strength of these two forms of solder should be similar.

VETERINARY MEDICINE

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NONIVASIVE REMOVAL OF A UROLITH IN A GELDING USING PULSED DYE LASER LITHOTRIPSY.

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Urolith removal in adult horses historically has required mechanical fragmentation and removal via the urethra in females or perineal urethrostomy in males. Intact (less traumatic) removal has required a caudal midline laparotomy and cystotomy. The latter has been preferred due to excessive soft tissue trauma caused by impact fragmentation of the urolith. A recent report related pulsed dye laser lithotripsy in the standing gelding accessing the urolith via perineal urethrostomy. The present case report describes the procedure in a gelding in which perineal urethrostomy was not possible due to his work schedule. The bladder was accessed via 100-cm video endoscope inserted through the penile urethra. Distention of the bladder was accomplished using sterile saline administered using an arthroscopic pump attached to the biopsy channel of the endoscope. The laser fiber was inserted through a pinhole in the latex tubing adjacent to the biopsy channel portal in the endoscope. Evacuation of urolith fragments from the bladder was accomplished by distending the bladder with saline and suddenly evacuating it through a large catheter placed at the neck of the bladder to capture all fragments. Evacuation of fluid from the bladder was aided by manual compression of the distended bladder per rectum. All fragments were successfully removed and the horse returned to work immediately.

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CLINICAL EFFECT OF NON-FOCULISED CO_2 LASER ON TRAUMATIC ARTHRITIS IN HORSES.

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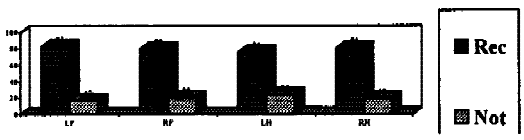
Traumatic arthritis in fetlock joints of 169 horses were treated either intraarticularly or with CO_2 laser in a comparative study. Of all horses visiting the equine hospital during an 18 months period, diagnosed with synovitis of metacarpo-phalangeal or metatarso-phalangeal joints, 169 returned after 3-4 or after 7-10 weeks for a re-examination. Of these horses (Warmbloods, Standardbreds, Thoroughbreds and Ponies) 83 were treated intraarticularly with hyaluronan combined with Betamethason and 86 with non-foculised CO_2 laser (25 W). All horses were treated in one to four fetlock joints. The clinical diagnosis is important to confirm in the lameness examination preceding treatment and only acute synovitis and capsulitis have been treated in this study. The diagnosis was confirmed with an intraarticular anaesthesia. Result of treatment was evaluated as fully recovered or not recovered. The intraarticular treated joints revealed 65-72% fully recovered joints whereas non-foculised CO_2 laser treatment showed 76-83% fully recovered joints. There was no significant difference between the results of the two different treatments. The results of this study indicate that treatment of acute traumatic arthritis with non-foculised surgical CO_2 laser reveals at least an equal therapeutic effect compared with conventional therapy and thus may be an interesting complement in treating lameness in athletic horses.

Fig. Result of laser-treatment. Fully recovered or not recovered in %.



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TREATMENT OF ROOT SURFACES OF CAT TEETH WITH THE HOLMIUM:YAG AND CARBON DIOXIDE LASERS FOR ACID RESISTANCE - IN VITRO STUDY

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The Holmium:YAG laser at 2.12 wavelength was compared to the Carbon Dioxide laser at 10.6 microns wavelength in a study to induce resistance to demineralization on the dentinal root surfaces of extracted cat teeth in vitro. The teeth were exposed to Holmium:YAG and Carbon Dioxide laser irradiation after an application of resin/fluoride mixture. The root surfaces of the teeth were exposed using an untreated control and an experimental site on the opposite sides of the teeth. The Ho:YAG laser with a 3 mm spot size covered areas of 3.5 to 12 mm^2 with 7 to 20 joules with a fluence of 0.25J/mm^2. The CO_2 laser with a 1.4 mm spot size covered areas of similar sizes with the same joules and a fluence of 0.25J/mm^2. All teeth were decalcified in a 0.1 Molar Sodium Acetate-Acetic Acid Buffer Solution (pH 4.63) for a 7 day

timed period. Samples were prepared for staining by sectioning the teeth 3 mm apically from the dentinoenamel junction. Two layers of varnish were applied to the crowns of the teeth. The teeth were inverted and stabilized in containers to allow the laser exposed portion of the roots to be covered with toluidine blue dye without contact of the dye on the cut sections of the root surfaces. The depth of dye penetration from the outer surfaces into the dentin was observed for laser treated and control sites. Then, toluidine blue was placed in the root canal areas to observe dye penetration from the canal area into the dentin. Consistently, toluidine blue dye showed greater depth of penetration from the outer surfaces into the dentin of the untreated control sites versus treated sites for the Ho:YAG and CO_2 laser groups. Both laser treatments showed consistent resistance to toluidine dye penetration from the outer root surfaces into the dentin. The Ho:YAG laser treated sites showed less penetration of the dye from the root canal areas into the dentin than the CO_2 laser treatment. The specimens were prepared for histological examination using hematoxylin and eosin stains. The histological slides showed patterns of tooth alterations in the same areas as the toluidine blue dye technique.

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TREATMENT OF FELINE NASOPHARYNGEAL STENOSIS WITH THE CARBON DIOXIDE LASER. Thomas R. Fry, Cascade Veterinary Specialists, Issaquah, WA.

A case report utilizing a 20 watt carbon dioxide (CO2) laser to resect congenitally redundant nasopharyngeal mucosa in a cat is discussed. A three year old male domestic shorthair cat was presented for a lifelong history of copious mucopurulent nasal discharge and mouth breathing. Repeated oral and parenteral antiobiotic regimens as well as nebulization with gentamicin had been ineffective for the previous 24 months. Under general anesthesia, laryngoscopic examination revealed no caudal free edge to the soft palate. The palatine mucosa was confluent with lateral and dorsal pharyngeal mucosa. No pharyngeal openings into the nasal passage were noted. Additional examination with a fiberoptic endoscope in a retroflexed position also found no ostia and the nasopharyngeal mucosa was normal in appearance. A CO2 laser used in continuous wave mode with a 0.3 mm, metal tip on 6 watt power setting was used to resect an elliptical piece of mucosa. No bleeding was noted. The free edge of the soft palate was reconstructed by suturing the ventral free mucosal edge to the dorsal free mucosal edge with 4-0 poliglecaprone in simple continuous fashion. The defect in the dorsal pharynx was closed by suturing the free edge of the dorsal pharyngeal mucosa to the dorsal nasal mucosa. Amoxicillin clavulinic acid suspension was administered for ten days postoperatively. Nasal discharge resolved immediately postoperatively and the cat made a complete recovery, and is normal 21 months following surgery. No upper respiratory infections or any other respiratory problems have been noted since surgery. The CO2 laser was a useful adjunct for treatment of this pharyngeal congenital defect.

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Treatment of Upper Airway Obstruction in the Dog Using a Carbon Dioxide Laser. Charles A. Williams, Vienna, Virginia

A 20 watt CO2 was used to repair upper airway disease in two dogs. Case one was in a 5 year old Sheltie that was presented for dental prophylaxis. This dog had been de-barked and had a history of dyspnea and "tiring easily". He was mask induced with isoflurane. When intubation was attempted it was found that a laryngeal scar had formed as a complication from the de-bark surgery. The laryngeal opening was so small that even a 3mm endotracheal tube would not pass. The membrane occluding the larynx was cut with an electroscalpel, a 6mm endotracheal was placed and the dental prophylaxis completed. Recovery was uneventful and the owners reported a vast improvement in his breathing and stamina. However, nine months later when the patient presented for follow up treatment of periodontal disease, it was discovered that the laryngeal scar had reformed. This time the scar was cut using the CO2 laser with continuous wave setting of 10 W and a 0.8 mm ceramic tip. It was difficult to incise or ablate the scar without causing damage to the deeper tissues within the larynx, never the less, there was enough immediate success once again to allow the passage of an endotracheal tube. There was great improvement initially, but like with the first attempt, a new scar formed and he became dyspnic once more. On the third attempt, a rhinology handpiece with a backstop was utilized in order to prevent laser damage to the deeper structures and the scar was successfully ablated. This time we have enjoyed long term success with no reoccurrence of scaring. Case two involved a congenital upper airway obstruction in a brachycephalic dog. This 6-year-old male Pug was presented with a history of "passing out" after mild exertion. On physical examination it was determined that he had both constricted nares and elongation of the soft palate. The condition was successfully corrected utilizing the CO2 laser. An 0.8 mm ceramic tip and a continuous wave setting of 12 W were used to ablate the tissue constricting the nares. The soft palate was easily and successfully resected using a rhinology handpiece with a backstop. The setting used was continuous at 15 W. Recovery was uneventful with dramatic improvement seen.

MINI-TALK SUMMARIES

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THE EFFECT OF ENERGY DENSITY AND NUMBERS OF TREATMENT ON THE RESPONSE OF KELOID STERNOTOMY SCARS TO THE 585 NM FLASHLAMP-PUMPED PULSED-DYE LASER. **Woraphong Manuskiatti, Richard E. Fitzpatrick. Dermatology Associates of San Diego County, Inc., La Jolla, CA**

Purpose: The 585 nm flashlamp pulsed dye laser (PDL) has proven to be a treatment of choice for hypertrophic scars and keloids. This study was performed to determine whether the therapeutic outcome responds variably to the energy density (fluence) of the laser pulses and numbers of treatment.

Method: Ten previously untreated, erythematous hypertrophic or keloidal median sternotomy scars of ten patients were divided into four segments and were randomly treated with a 585 nm PDL at a fluence of 3, 5 and 7 J/cm^2 to three of four segments every four weeks for a total of six treatment sessions. One segment of each individuals' scars was untreated and served as a control. Clinical assessments including scar height, erythema and pliability were done before and every eight weeks for a total period of 32 weeks.

Results: A significant improvement in scar height, erythema and pliability was noted in laser-treated scar areas. There was no significant difference in treatment outcome versus the fluence of the laser though there was a trend for lower fluences to be more effective (3 better than 5 better than 7). Sequential laser treatments provided greater resolution than one or two treatment sessions.

Conclusions: The clinical improvement of hypertrophic scars following treatment with the PDL demonstrates no fluence dependence. Multiple treatment sessions is suggested for achieving greater response.

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INTENSE PULSED LIGHT FOR NON-ABLATIVE SCAR REVISION: RETROSPECTIVE ANALYSIS OF 50 PATIENTS

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Multiple laser devices have been reported effective for erythema reduction and flattening of a variety of traumatic and surgical scars with some involving ablation of the epidermis. Since 1996 we have been utilizing intense pulsed light without epidermal ablation to improve the appearance of scars specifically for improvement in texture, color, and pliability. In this retrospective analysis, sequential photographic and clinical assessments had been recorded in the charts. Treatment had consisted of intense pulsed light utilizing the 550 nm, 570 nm, or 590 nm filters, fluences between 30 and 40 J/cm2 and pulse durations from 3 – 7 milliseconds to an end point of temporary scar blanching, darkening or erythema. Symptomatic improvement of scars was reported in most patients after one treatment at one month. Side effects were epidermal crusting in 3 patients and blistering in 1 patient. No purpura was noted. Decreased scar erythema with improved texture and pliability was observed after an average of 2.3 treatments. Patients seen at 2- 3 years follow-up had no recurrence or deterioration of their clinical improvement. Intense pulsed light is a valuable alternative modality for reduction of size, decreased erythema and textural improvement of traumatic and surgical scars.

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VISUALIZATION IN DIAGNOSTICS AND TREATMENT MONITORING OF PHYSICAL CONDITIONS LIKE PORT-WINE STAIN.

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Port-wine stain (PWS) and other dermatologic conditions are difficult to evaluate by the visual appearance of the skin only. Reflectance spectra measured in the visible wavelength region can give information about optical properties and prognostic outcome due to laser treatment. It would be useful to be able to predict difference in color resulting from treatment of such lesions. The method presented combines existing methods for evaluation of skin reflectance spectra, and color coordinates with a visualization of the skin color. CIE color coordinates are calculated and the skin color is reconstructed from these coordinates. The simulated color is presented on a CRT-screen as device independent sRGB values (IEC 61966-2.1). Reflectance spectra have been measured prior to and 3-4 months after treatment to evaluate the therapy response. Change in skin reflectance and calculated color difference is evaluated together with a visual presentation of the colors prior to and after treatment.Furthermore, reflectance spectra of typical PWS and normal skin are simulated using a mathematical model based on diffusion approximation. Colors are calculated to show how different factors such as changes in tissue scattering, pigmentation and water content of the skin affect the skin color. For several patients spectra measured after treatment show increased reflectance. When this increase was mainly in the wavelength region 400-600 nm, this had a great impact on the visualized color, changing to a less red color. The most important potential for this method is to predict if the color differance due to treatment will be large enough to give visible color change, or if it is best to terminate treatment. This method promises to become an useful tool to predict the effect of laser-treatment and to prepare the patient on the realistic color change treatment will give.

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IDENTIFICATION OF TWO DISTINCT TYPES OF HEMANGIOMAS

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Elaine Sigfried MD and Ilona Friedan MD

Purpose: To determine if there were any sites of predilection for hemangiomas and if so, whether or not they followed any recognizable pattern

Method: A random sample of 160 children with a confirmed diagnosis of facial hemangioma were selected. The location of each lesion was carefully marked on a schematic representation of the face and then each location was assigned a number. Any subsequent lesion occurring at the same site was assigned the same number. The pattern of sites was then compared with embryological patterns of known pathologies.

Results: A total of 171 lesions were analyzed. It became apparent that two patterns of involvement were present, diffuse and focal. 85% were focal and 15% were diffuse. The distribution of diffuse lesions followed the dermatomal patterns and were therefore designated as V1, V2 or V3 lesions. V1 & V3 lesions were the most common and V3 lesions were associated with upper airway obstruction in 36% of cases. 75% of V2 lesions were ulcerated. The focal lesions on the other hand rarely ulcerated (12%), and tended to occur at or adjacent to the lines of embryonic fusion of the facial mesodermal prominances. The most common focal site was the nasal tip followed by the upper lip, the medial canthus and the lower lip. These sites accounted for 67% of facial lesions.

Conclusion: Two distinct groups of hemangiomas exist, focal and diffuse. These two groups follow different patterns of involvement, behave differently and may well respond differently to treatment.

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The Effect of Dynamic Air Cooling on the Clinical Efficacy of Pulsed Dye Laser Treatment.

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Scotland U.K.

We have previously observed that dynamic air cooling substantially reduces the post treatment morbidity following pulsed dye laser treatment of vascular lesions. The purpose of this study was to determine the relationship between skin temperature and clinical effect in the treatment of port wine stains.

A Cryo 5 air cooling system was used to cool the skin to different temperature levels during treatment with a Chromos 585 pulsed dye laser at fluences between 4.3 and 4.8J/cm^2. The temperature on the skin was measured using a hand held infra red temperature sensor. Photographic records were taken immediately prior to and 6 weeks post – treatment.

In areas of port wine stain treated at different skin temperatures, yet the same fluence, there was a correlation between clinical efficacy and skin temperature.

These preliminary findings highlight the potential importance of assessing skin temperature at the time of test patch with a view to optimising the clinical response of individual Port Wine Stains.

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CLINICAL AND PATHOPHYSIOLOGIC CORRELATES OF 1064 ND:YAG LASER TREATMENT OF RETICULAR VEINS

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Background: Laser/Flashlamp therapy is an excellent alternative for treatment of vessels that are non-cannulizable, friable or for patients who do not want injections. The present study examined the histological and clinical effects of a 1064 Nd: YAG laser on Class I-III vessels of the lower extremities.

Materials and Methods: Ten female patients Fitzpatrick skin type I-III, mean age 41, with leg Class III reticular veins (3-5 mm) were treated with a single treatment session utilizing a 1064 Nd:YAG laser after reflux was ruled out by Doppler/PPG exam. A 6mm S-S, single pulse, PD 14 msec, E=26 joules. A 4mm biopsy was taken from the treated vessel and control site. A third biopsy was taken from the treated vessel, 5 cm away from the first biopsy to avoid artifact. Specimens were studied by routine histology. Special stains were performed to study collagen and elastic tissue. Expression of heat shock protein (hsp70) was analyzed. Apoptosis levels were studied by the TUNEL method.

Results: Biopsies after treatment showed intravascular thrombosis and loss of eosinophilia in the cytoplasm of the myocytes in the vessel wall and extravasated RBC's. Elastic tissue in the vessel wall was fragmented. In six of the follow-up biopsies, a large vein was present showing extravasated RBC's and fragmented elastic fibers. In both tx and follow-up biopsies, there was expression of hsp70 in the endothelial cells and myocytes. No differences were found in the number of TUNEL + cells. Eight of ten patients (80%) manifested total clearing measured by clinical evaluation Doppler closure, and chromatography.

Discussion: The 1064 Nd: YAG laser induces vascular thrombosis and damage to the vessel wall. Increased expression of hsp70 by the myocytes of the damaged vessel supports a heat-induced stress. Apoptosis does not play a role. Pan vessel fibrosis does not occur on a regular basis. Vessel flow interruption as measured by Doppler exam shows that vessel integrity has been interrupted, and is correlated with clinical efficacy.

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THE USE OF A NEW LONG PULSED DYE LASER FOR THE TREATMENT OF PHOTODAMAGED SKIN

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Pulsed dye lasers have traditionally been used to treat telangiectasias. In the last several years, it has been shown that this laser can improve the appearance of striae, which have abnormal collagen and elastin. Recently, the pulsed dye laser has been used successfully to treat photodamaged skin. One of the side effects that is particularly bothersome for the patients is the post treatment purpura. In this study, a new and experimental pulsed dye laser with a longer effective pulse duration was used to treat facial photodamage.

Ten consenting subjects with moderate facial photodamage were enrolled in the study. The perioral or periocular area on one side of each subject's face was treated three times, six weeks apart, with a long pulsed dye laser coupled with a dynamic cooling device (λ = 589 nm, pulse duration 20 ms, Candela Corp., Wayland, MA). The other side of the face was treated with only the cooling device. Photographs were taken before each treatment and 3 months after the last treatment. Profilometry was done at the beginning and end of the study. 3 patients underwent skin biopsies before and after the treatments to evaluate changes in collagen and elastin.

None of the patients experienced any purpura after the treatments. This study highlighted the differences between a long pulsed dye laser and sham laser for the treatment of photodamage.

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A CLINICAL AND HISTOLOGIC EVALUATION OF 1320nm Nd:YAG LASER IRRADIATION ON HUMAN SKIN.

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1320 nm Nd:YAG subsurface remodeling has been shown to provide mild improvement in treated rhytids. It has been assumed, yet not proved, that this improvement occurs because of new papillary collagen formation. The purpose of this study was to evaluate the clinical and histologic changes occurring after treatment with a 1320nm Nd:YAG laser. Ten subjects with class I-III rhytids and Fitzpatrick skin types I-II were treated 4 times with a 1320nm Nd:YAG laser. Subjects were evaluated for degree of clinical improvement and histologic evidence of new collagen formation six months after their final treatment. Eight subjects showed subjective improvement in the quality of their skin. All ten subjects showed histologic evidence of new upper papillary dermal collagen formation. 1320nm Nd:YAG laser irradiation can lead to new collagen formation and associated clinical improvement. Such improvement can occur without epidermal ablation.

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INDICATIONS AND APPLICATIONS OF MINIMALLY INVASIVE SPINE SURGERY WITH ADVANCED MINIMALLY INVASIVE SPINE SURGERY TECHNIQUE FOR HERNIATED SPINAL DISCS - 720 CASES.

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Purpose: To demonstrate and to describe the authors experience with percutaneous microdecompressive endoscopic spinal discectomy with application of collagen and disc shrinkage effect of Holmium laser at lower non-ablative energy level (laser thermodiskoplasty), performed with ease, safety and efficacy for symptomatic non-extruded herniated nucleus pulposus at cervical, thoracic and lumbar spine.

Materials andMethods: Since 1995, 720 cases, 1224 spinal discs, still symptomatic in spite of at least 12 weeks of conservative care, were treated with percutaneous microdecompressive endoscopic spinal discectomy and low level non- ablative Holmium laser thermodiskoplasty, i.e., collagen tissue and disc shrinking/tightening Holmium laser. All cervical and lumbar herniated discs demonstrated unilateral radicular pain of a specific dermatome confirmed with EMG/NCV. MRI or CT scans demonstrated a contained soft intervertebral disc herniation in all cases. The levels of the discs included 647 lumbar discs, 503 cervical discs, and 74 thoracic discs.

Results: Postoperative follow-up demonstrates 95.5% (688 patients) did well (good to excellent). There were no intraoperative or postoperative complications. Nine patients demonstrated persistent mild residual pain and paresthesia. The average time to return to work was ten days for the non-workers' compensation patients. A computerized finite element model of the herniated disc, pre and post laser discectomy with collagen tissue tightening or shrinkage, i.e., laser thermodiskoplasty at the collar and the shoulder of the disc is presented. It demonstrates the results of a computerized model for laser induced collagen tissue and the disc shrinkage and contraction for the purpose of disc decompression in spinal discectomy.

Conclusion: This new Holmium laser thermodiskoplasty technique in laser percutaneous microdecompressive endoscopic spinal discectomy appears to be easy, safe and efficacious. This less traumatic, easier outpatient treatment leads to excellent results, faster recovery, and significant economic savings.

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UTILIZATION OF A HEAT-CONDUCTING TEMPLATE TO REDUCE LATERAL THERMAL DAMAGE

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The purpose of this study was to evaluate the effects of varying the slit width of a heat-conducting template with the free electron laser (FEL) at 6.45 μm. A stainless steel caliper with a slit width ranging from 0.2 to 2.5 mm was utilized as a heat-conducting template and placed on human skin obtained as excess tissue from mammoplasties. The FEL, utilized at 30 HZ with fluences from 10-13 J/cm^2 was used to generate 1.0 cm long incisions. Histologic slides of the specimens were stained with Gomori's Trichrome and analyzed for lateral thermal damage using computerized morphometric analysis. The spot size of the FEL at a wavelength of 6.45 μm was determined to be 626 μm ±100 μm using a moving knife edge. The lateral thermal damage was reduced as the slit width of the heat-conducting template was reduced to near and below the calculated spot size. Our findings support the concept that lateral thermal damage can be reduced by utilizing a heat-conducting template with a slit width approximating the FEL's spot size.

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THE Er:YAG LASER IN SOFT TISSUE INCISIONAL SURGERY: AN UPDATE

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Kimberly A. Klippenstein, M.D.

Purpose: To report on the utility of the recently updated Er:YAG laser in soft tissue incisional surgery.

Methods: 12 eyelids of 6 patients underwent incisional procedures with the Sciton Contour Er:YAG laser. This laser has been substantially modified since our report last year on this same topic. The laser now produces a 0.25mm beam that is generated by multiple laser heads. Ablation and coagulation are controlled independently using a unique software package that differs from that used for skin resurfacing. These modifications give the surgeon precise control over the beam. Procedures performed included upper and lower blepharoplasty and upper eyelid ptosis repair.

Results: The Er:YAG laser was highly effective as a soft tissue incisional device. Intra-operative hemostasis was excellent, thermal injury to tissue was less than or equal to that produced by CO_2 laser, and the laser could be adjusted in small increments to allow precise dissection of delicate structures.

Conclusion: The Sciton Er:YAG laser may be used to perform periorbital soft tissue incisional surgery with effectiveness similar to that achieved with CO_2 lasers

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"HOT" KTP LASER TREATMENT OF FACIAL ANGIOFIBROMATA

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Treatment of facial angiofibromata (AF) in the past has involved cutaneous resurfacing by dermabrasion, chemical peeling, CO_2 and Er:YAG lasers. While effective, these methods typically affect large areas encompassing normal adjacent skin and require prolonged wound care and risk of dyspigmentation, scarring, and infection. We chose the long pulsed KTP (532 nm) laser for its high absorption by melanin and hemoglobin as a potentially useful photothermal destructive method for treating AF. In five patients (Fitzpatrick types II-VI), AF were treated with KTP (VersaPulse, Coherent, Palo Alto, CA) laser (10 ms, 20 J/cm^2, 2 mm) using stacked pulses (2-3.3 Hz) or passes. No contact cooling device was employed. Each delivered pulse evoked puffs of steam and caused progressive flattening of AF lesions to a level at or just below the surrounding skin surface. Mild gross tissue contraction was only occasionally observed. Normal intervening skin was avoided. Patients underwent from 1 – 5 sessions in which as many as 100 lesions were treated under local anesthesia. Wound care consisted of BID wound cleansing with H_2O_2 and application of antibacterial ointment til healed. Patient satisfaction with this method was high due to rapid healing time (< 10 days), minimal pain, ease of wound care, and efficacy. Individual lesions typically responded with complete flattening within 1-2 treatments. While this effect has persisted for 6 – 12 months (by 9/99), slow recrudescence of lesions is expected. This patient group experienced only transient hyper- and hypopigmentation localized to the lesion sites. No scarring, infection, or other adverse events were observed. "Hot" KTP laser is an effective and safe method of treatment for facial AF. This technique of limiting the treatment only to lesional skin allowed rapid healing and very limited adverse effects despite the presumably increased thermal damage caused by high fluence, long pulse duration, and an absence of superficial tissue cooling.

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THE TREATMENT OF SOLAR LENTIGINES WITH THE DIODE (DIOLITE 532NM) AND THE Q-SWITCHED RUBY LASER: A COMPARATIVE STUDY

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Purpose: The Q-switched Ruby laser has been shown to be a safe and effective procedure to remove unwanted solar lentigines. The purpose of this investigation is to compare another modality, a diode pumped, solid state, frequency-doubled Nd:YAG (532nm), with the Q-switched Ruby laser in the treatment of solar lentigines.

Methods: Ten patients with solar lentigines were treated with diode pumped (532nm) and Q-switched Ruby lasers to one half of the lesions on extremities. A topical carbon based lotion was used only with the diode laser to outline the lesions and increase the specificity and efficacy of the treatment, as suggested by the manufacturer. Photographic and clinical evaluations of the solar lentigines were performed pre- and postoperatively. Patient's subjective assessment of the results and the treatment associated pain were also obtained.

Results: The diode pumped (532nm) and Q-switched lasers showed similar effectiveness in removing solar lentigines. Both lasers were associated with minimal intra-operative pain and short recovery periods.

There was no scarring or permanent pigmentary changes associated with either laser.

Conclusions: The diode pumped, frequency-doubled Nd:YAG (532nm) laser is an effective treatment option for removal of unwanted solar lentigines. For the patients, the diode pumped laser is an alternative, equally effective treatment option for removal of these lesions. For the physicians, the diode pumped laser is less expensive (purchase price and maintenance) and more portable than a Q-switched Ruby laser. In addition, the diode pumped laser does not require any warm up time and can be utilized to treat facial telangiectasias and potentially leg veins and other pigmented lesions.

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Title: Evaluation of Long Pulsed Alexandrite Laser and Q-switched Ruby Laser for the Treatment of Benign Pigmented Lesions.

Authors: Wendy W. Lou, Arielle N.B. Kauvar, Roy G. Geronemus
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Purpose: To evaluate the safety and efficacy of long pulsed alexandrite laser photothermolysis with and without additional Q-switched ruby laser photothermolysis in the lightening of congenital nevi.

Methods: The study enrolled twenty subjects with skin types I-IV with small-or medium-sized congenital nevi with no suspicion of malignancy as examined by two dermatologists. Using the long pulsed alexandrite laser, fluences of 30 to 65 Joules/cm^2 were applied either with a cryogen cooling spray of 20 - 30 milliseconds or without cryogen spray. Those lesions that had darker macules within the larger congenital nevi were additionally treated with a Q-switched ruby laser during the same session. Patients received 3 - 4 treatments at 4 - 8 week intervals.

Results: Significant clearing of the congenital nevi were noted using the long pulsed alexandrite laser with and without additional Q-switched ruby laser treatments. These results appear to be at least as favorable as using the Q-switch ruby laser alone. Side effects were minimal and transient in nature.

Conclusions: The long pulsed alexandrite laser may be used with or without a Q-switched ruby laser safely and effectively to treat benign congenital nevi with a goal of decreasing its apparent pigmentation.

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EPILATION: COMPARISON OF FLASH LIGHT AND DIODE LASER

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To compare the efficiency of two different epilation modalities 19 volunteers were treated half-side with a non-coherent filtered flash lamp (EpiLight™) and a diode laser system (LightSheer™)

Hair counts where obtained before each treatment (#) within marked rectangles. By now the second # and consecutive hair counts were performed in 15 of 22 volunteers (16 females, 6 males) in 7 different localizations (back, bikini, cheek, chin, forearm, neck, upper lip) after intervals of 4 (face) or 8 (body) weeks. According to the clinical reaction the following parameters were used: 25-40 J/cm² and up to 30 ms for the diode laser, 31-50 J/cm² and 2-4 x 4-6 ms (10-30 ms delay) for the IPL using the 645 cut off filter.

During the first two #s an increasing reduction of hair growth was seen with both methods: after one # the diode laser test fields showed 36,9% hair loss, increasing to 62,1% after two #s (p=0,009), whereas the IPL achieved 28% hair loss after one #, increasing to 39,2% after two #s (p=0,02). With two #s the diode laser realized quicker hair removal than IPL: 62,1% vs. 39,2% (p=0,003) concerning the means out of all investigated localizations. According to different localizations after two #s both modalities got a better epilation response at the back compared to the bikini area: for the diode laser 60,7% vs. 44,4% (p=0,01), for IPL 44,5% vs. 22,7% (p=0,02). Again the diode laser showed quicker epilation at the back after two #s: 60,7% vs. 44,5% (p=0,04).

In conclusion both systems achieved a reduction of hair growth. After two #s the diode laser performed a better hair reduction. Looking for regional differences, the back showed a better epilation compared to the bikini area. These preliminary data after two #s cant tell anything about long term efficacy and differences.

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THE EFFECT OF VARYING THE DURATION OF DYNAMIC COOLING ON THE SAFETY OF LASER HAIR REMOVAL

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This study is designed to evaluate the effect of varying the dynamic cooling in minimizing epidermal damage and pain.

Patients with skin type V were treated with the alexandrite laser (755nm, 3msec, Gentlelase, Candela, Wayland, MA) using the minimum fluence that would result in perifollicular erythema and edema without dynamic cooling (tetrafluoroethane). Skin with similar hair density and color was then subsequently treated at the same fluence and spot size (12mm), with increasing spray duration to a maximum of 100 msec. The spray delay was set at 1 msec. The degree of pain, epidermal crusting, hyperpigmentation and hypopigmentation and scaring was recorded immediately at the time of treatment, at 24 hours, at 1 week and at 1 and 3 months.

Increasing the duration of the cooling spray did result in significantly less discomfort to the patient and less to no epidermal damage, compared with no or shorter spray duration.

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IMPROVED RESULTS WITH LASER HAIR REMOVAL USING A STRUCTURED TREATMENT PROTOCOL

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The purpose of this study was to determine whether a structured treatment protocol for laser hair removal improved clinical results. A total of 200 patients were treated over a consecutive 16 month period for unwanted body hair using the Cynosure long pulsed Alexandrite laser. Laser parameters were determined according to Fitzpatrick skin type and hair color. Documentation was obtained with digital photography. 100 patients (Group A) agreed to a protocol of 4 regularly spaced treatments during the defined period. 100 patients (Group B) were allowed to determine their own treatment plan with respect to timing and frequency (not exceeding 4 treatments). There were no significant differences

between groups in age, gender, or treated areas. Patients were examined and surveyed 3 months after the conclusion of the treatment period. Clinical results were defined as reduction of hair in the treated area. Group A experienced an average reduction of hair in the treated area of 78 +/- 8 % with 4 treatments per patient. Group B experienced an average reduction of hair in the treated area of 48 +/- 12 % with an average of 2.4 +/- .5 treatments per patient. The differences in hair reduction and treatment frequency between the groups were statistically significant ($P < .05$). In addition, patient satisfaction with the treatment was evaluated using an assessment scale of 1 (excellent) to 5 (poor). Group A reported a satisfaction rating of 1.4 +/- .3 while Group B reported a satisfaction rating of 2.5 +/- 0.5. These values were statistically different ($P < .05$). Using regression analysis, a positive linear relationship was identified in Group B between treatment frequency and hair reduction ($r = .94$). Likewise, a positive linear relationship was identified between treatment frequency and patient satisfaction ($r = .89$). This study concludes that "enrolling" patients in a structured treatment protocol leads to superior clinical results and improved overall patient satisfaction following laser hair removal.

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LONG-PULSED ND:YAG LASER-ASSISTED HAIR REMOVAL IN PIGMENTED SKIN: A CLINICAL AND HISTOLOGIC EVALUATION

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Purpose: To report on the clinical efficacy and histologic effect of long-pulsed Nd:YAG laser irradiation for hair removal.

Methods: A series of three long-pulsed (ms) Nd:YAG (1064nm) laser treatments were delivered on a monthly basis to a series of patients (skin phototypes III-V). Patients returned for follow-up at 1, 3, and 6 months after the final treatment session. During each treatment and follow-up visit, photographic and clinical evaluations were documented. Histologic specimens were obtained at baseline, immediately after the initial laser treatment, and at 1 and 6 months postoperatively.

Results: Significant hair reduction was seen after each of the three treatment sessions. Side effects included mild treatment pain and rare transient pigmentary alteration. Histologic tissue changes mirrored clinical response rates with evidence of selective follicular injury.

Conclusion: The long-pulsed Nd:YAG laser is a safe and effective method to effect hair reduction in patients with darkly pigmented skin.

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HAIR REMOVAL WITH LONG PULSED DIODE LASER IN SUBJECTS WITH SKIN TYPES III-VI

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Purpose: To determine the safety and efficacy of Lightsheer Diode Laser (800nm, 10-60 J/cm^2, 15-30 ms) in treating 32 subjects within skin types III-VI for hair removal.

Methods: 32 adult subjects with skin types III-VI were treated at a 5 x 5 cm site after determining the highest possible fluence tolerated which did not produce epidermal ablation. Test areas were treated and then retreated at six weeks. Hair counts, side effects and photographs were obtained pretreatment, 6 weeks, 3 and 6 months after second treatment. Additionally, elective treatment sites were offered to patients measuring 10 x 10 cm.

Results: A growth delay was seen at all sites lasting 3 months. In darker skinned subjects an increased incidence of side effects hyperpigmentation/hypopigmentation was seen and lower fluences were tolerated. Generally, side effects resolved by six months.

Conclusion: The long pulsed diode laser can produce growth delay in darker pigmented skin types. The incidence of hyperpigmentation increases in higher skin types and resolved in skin types III-V by six months.

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LONG-TERM EFFICACY OF LASER-ASSISTED HAIR REMOVAL IN FITZPATRICK SKIN-TYPES IV,V,&VI USING 800 nm DIODE AND 755 nm ALEXANDRITE LASERS

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New York University Medical Center, New York, New York

PURPOSE: To evaluate long-term laser epilation in dark skin phototypes using long-pulsed diode and alexandrite lasers. Both laser efficacy and complication rates are reported.
METHODS: Facial regions of 20 patients with Fitzpatrick skin types IV-VI were treated with both the long-pulsed alexandrite and diode lasers using fluences from 8-25 J/cm^2, for six laser sessions. Epidermal cooling was achieved using contact cooling and/or a chilled water-based gel application. Bilateral comparisons were based upon degree of re-growth, improvement of folliculitis, and the severity of side-effects. Pre- and postoperative photographs and patient subjective ratings were recorded. Average follow-up after final laser session was 12 months, (range 8-24 months).
RESULTS: Average delay in hair re-growth after a single laser treatment was 3 weeks and after four treatments significant hair reduction was maintained for up to 3 months. After six laser treatments, hair reduction was found to be 60% at 1 month, 40% at 6 months, and 20% at 12 months. Complications included hyper- and hypopigmentation which occurred more frequently with the alexandrite laser. While differences in treatment outcomes between lasers were noted, there were no significant differences in efficacy. Compared to the alexandrite laser, fluences were increased 20%-40% when treating with the diode laser. Although hair reduction was similar, patients with folliculitis and hyperpigmentation preferred the alexandrite laser, while those without folliculitis preferred diode laser treatments. Overall, the diode laser was rated as least painful; however, perioral "discomfort" occurred with diode laser treatments. No permanent scarring or dyspigmentation developed.
CONCLUSIONS: The 755 nm alexandrite and 800 nm diode lasers are safe and effective for hair removal in Fitzpatrick skin phototypes IV-VI using fluences below 20 J/cm^2. However, multiple laser treatments are necessary and the degree of long-term hair removal is less than previously reported with lighter skin-types. Pigmentary side-effects were common.

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EVALUATING THE 3 MSEC ALEXANDRITE LASER WITH CRYOGEN COOLING SPRAY FOR HAIR REMOVAL

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This study evaluated the short and long term (2 years) safety and efficacy of the 3 millisecond alexandrite laser with a tetrafluoroethane cooling spray after both single and multiple treatments.

After an optimal fluence level was determined, 85 patients with skin types I to IV had two adjacent or very similar areas shaved. One site was treated with the 3-msec alexandrite laser with the tetrafluoroethane cooling spray, and the other was left as a control. The two areas were evaluated for hair count, hair width, and any side effects or complications at one week, one month, and three months. One subset was treated only once and the other subset was treated up to three more times and both were followed for up to twenty-four months.
There was a minimum of side effects at one-week and no long-term side or adverse effects noted at 3 months. At three months, the mean reduction in hair count following the single treatment was 41.2 % (range 10 – 89%) and the mean reduction in hair width was 34.3% (range 16.7% - 80.0%). The subgroup treated only once showed a mean reduction in hair count of 30.1% (range 8.97% - 88.5%) and a mean reduction in hair width of 30.4% (range 0% - 57.1%) at eighteen months. The subgroup treated up to three times showed significantly greater hair reduction.

The 3-msec alexandrite laser with a tetrafluoroethane cooling spray offers a for safe and very effective method long term laser hair removal.

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Hair Reduction with a Very Long Pulse Infrared Diode Laser.
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Purpose: To prospectively evaluate the clinical safety and efficacy of a low power, continuous wave long pulse infrared diode laser system for the purpose of hair reduction.
Methods: Ten patients were prospectively evaluated in this pilot study. Skin types I-III were evaluated. Each participant received 12 treatments on the upper lip with continuous wave irradiance of 770-840 nm diode laser light 9.6 Joule and 6 second pulse duration with 3.0 mm spot size. Hair counts were made preoperatively and at three months post-initial treatment. Digital images were recorded at one week, four weeks, and three months. A novel OCD camera/computer hair counting system was used for hair counts as well as manual hair counts. Patient diaries were used to document post-treatment effects.
Results: Initial evaluation show that hair reduction treatment with a very long pulse infrared diode laser is relatively painless with no significant side effects. Final hair count data was not yet available at the writing of this abstract. A detailed evaluation of hair reduction and clinical outcomes at three months, and comparison with data from previous single treatment studies will be presented.
Conclusion: The long pulse continuous wave infrared diode laser is a novel new option for laser hair removal. The relatively low cost and the unit's small size/portability are positive but the small spot size and multiple treatments are relatively slow compared to other long pulse hair lasers of similar wavelength. The clinical improvement produced with such parameters is noteworthy. The success of accurate computer hair counting is also of interest.

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HAIR REMOVAL IN TYPE VI SKIN USING A LONG-PULSED 1064 nm LASER

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PURPOSE: The objective of this study was to observe the immediate effectiveness and long-term results of using a long-pulsed 1064 nm Nd:YAG laser for the removal of hair in patients with Type VI skin.

METHODS: Fifteen Type VI patients (>18 years) with one or more areas requiring hair removal were included in the study. The ESC Vasculight system using the Nd:YAG laser was used to treat each area for hair removal. Each patient received one or more treatments (with an average of four) with the long-pulsed Nd:YAG laser system using non-overlapping pulses at 4-6 week intervals. Serial photographs and clinical assessments were obtained preoperatively and at the end of treatment.

RESULTS: The Vasculight system with the long-pulsed Nd:YAG laser was effective in removing hair in Type VI skin with minimal side effects and without significant adverse sequelae.

CONCLUSIONS: Hair removal in Type VI skin can be effectively treated with the long-pulsed 1064 nm Nd:YAG laser system.

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SIMPLE BUT EFFECTIVE METHOD OF PAIN REDUCTION DURING ALA-PDT USING CONTINOUS COMPRESSED AIR COOLING

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During ALA-PDT the patients often suffer from strong burning, stinging and pain. We tried to find a simple and effective way of pain reduction with which the patients could tolerate ALA-PDT. However, an effective reduction of pain was achieved using a simple system of continous compressed air cooling (1 bar) of the lesion under ALA-PDT. Using thermography we could show, that the temperature of the exposed lesions was diminished only 3-4 degrees Celsius under pressure air cooling.
For grading of the pain we asked the patients to assess the grade of pain using a scale with grading of 0 (no pain) to 100 (strong pain). All patients reported a more then 50-60 % pain reduction under air cooling.
Our data demonstrate that the continous air cooling proved to be an effective, reasonable and simple method of pain reduction of ALA-PDT.

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TIME-BASED 5-AMINOLEVULINIC ACID (ALA) FLUORESCENCE FOR DIAGNOSIS OF ORAL MALIGNANCY.
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5-Aminolevulinic acid (ALA) has been used systemically for detection and diagnosis of dysplasia and malignancy. Objective of this investigation was to determine time-based fluorescence after topical ALA application to the oral mucosa. DMBA carcinogenesis was applied to the right cheek pouch in 16 Syrian golden hamsters for 4 and 9 weeks, respectively. The left cheek pouches served as control. Prior to sacrifice, 20% ALA was applied to the cheek tissues for 15, 30, 60, and 180 minutes, respectively. Excised cheek tissues were cryosectioned and imaged using low-level fluorescence microscopy with excitation at 405nm, and detection at 635nm. After fluorescence microscopy, H&E staining was performed and slides revisualized. Fluorescence development was earlier and peaks were greater in malignant tissues than in healthy tissues. In dysplastic tissues, intermediate effects were observed. In conclusion, time-based laser-induced fluorescence after tissue exposure to topical ALA is useful for detection amd diagnosis of oral dysplasia and carcinoma.
Supported by Ministry of Education, Japan, the Culpeper foundation, TRDRP 71T-0192, NIH (LAMMP) RR01192 and DOE DE903-91ER 61227.

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NON-ABLATIVE SUBSURFACE REMODELING WITH A 1064nm Nd:YAG LASER.

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The purpose of this study was to determine if a Q-switched Nd:YAG laser can be used to improve rhytids without epidermal ablation. 10 subjects, with Fitzpatrick skin phenotypes I-III and Class I-III rhytids, were treated 3 times with a Q-switched Nd:YAG laser over the course of three months. All subjects were treated at 5J/cm^2. Subjects were evaluated for degree of improvement and post-laser complications. Most subjects showed some degree of clinical improvement. Post-treatment purpura was a common finding. The Q-switched Nd:YAG laser can be used successfully for subsurface remodeling. The degree of improvement is not what would be expected in an ablative laser system.

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FACIAL REJUVENATION WITH A SUPERFICIAL ERBIUM:YAG LASER TREATMENT

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Purpose: To evaluate the use of an Erbium:YAG laser as a facial rejuvenation device
Methods: The full face of twenty volunteer subjects was treated with Er:YAG laser. All subjects applied EMLA cream for two hours before the procedure. A fluence of 5 or 10 J/cm^2 was used with a spot size of 5mm, pulse width of 250 μs and a repetition rate of 8 Hz. Each subject was treated with a single pass of Er:YAG laser. The post-operative care included washing with Cetaphil cleanser and applying Aquaphor ointment. During the follow up visits an evaluation was done for recovery time, side effects and improvement in facial skin in general and in wrinkle, scars, acne, melasma and photo-damage
Results: The recovery time was about 3 to 6 days depending upon the fluence used. None of the subjects showed any major side effects. There was a general improvement in skin appearance and texture in all subjects in each category evaluated
Conclusion: The Er:YAG laser is a safe and effective tool for facial rejuvenation. The recovery time is less then with the regular resurfacing and the improvement is minimal and short lived

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A PHANTOM WITH TISSUE-LIKE OPTICAL PROPERTIES IN THE VISIBLE AND NEAR INFRARED FOR USE IN PHOTOMEDICINE.

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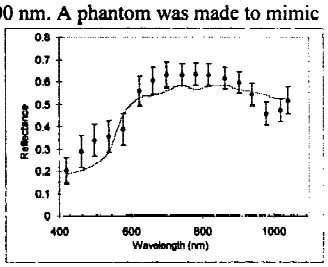
A tissue phantom has been developed whose scattering and absorption properties can virtually match those of biological tissues in a wide range of wavelengths from the visible to the near infrared. It consists of a transparent silicone rubber, as basic material, and Al_2O_3 particles and cosmetic powder as diffusers and absorbers. The silicone mechanical properties allow preparation of both optically homogeneous and heterogeneous medium with a thickness as thin as 0.1 mm. The optical properties of Al_2O_3 particles and cosmetic powder, i.e. total attenuation, absorption and reduce scattering coefficients and phase function, have been determined in the visible and near infrared spectral range, using direct and indirect technique. By varying the concentration of scattering and absorbing particles, optical properties of different tissues can be reproduced over a range of wavelengths from 400 to 1000 nm. A phantom was made to mimic the optical characteristics of human skin. In figure, the diffuse reflectance spectrum is reported (solid line). The comparison with skin reflectance (symbols), averaged over a sample of 260 patients, shows a reasonably agreement. The proposed technique allows to produce a stable and reproducible phantom, with accurately predictable optical properties, easy to make and to handle. This phantom is a useful tool for numerous applications involving light interaction with biological tissue.



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NON ABLATIVE LASER TREATMENT IN PIGMENTED SKIN AND SUNNY CLIMATES - SELF-ASSESSMENT

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The aim of this study was to evaluate the safety and effectiveness of the New Star Model 130 Nd:YAG laser system (Cool Touch™) for nonablative laser treatment of facial rhytides and acne scarring in pigmented skin patients and sunny climates.

30 patients Fitzpatrick skin types III-VI (10 with perioral rhytides, 12 with periorbital rhytides and 8 with acne scars) undergo 3-6 sessions (about 6 weeks apart) of treatment with a 1320 nm Nd:YAG laser (300μs, 100Hz, 28-38J/cm²) for nonablative resurfacing utilizing dynamic cryogen cooling spray.
All patients were satisfied with the reduction of wrinkles and scars. After 2 treatments 30% improve in wrinkles and 40% in scars. The results of the collagen stimulation become visible at about 8 weeks and continue to improve over the next 8-12 months. This nonablative laser technique leaves the epidermis intact and avoid hyper and hypopigmentation often associated with ablative laser skin resurfacing, particularly in pigmented skin and sunny climates. The use of cryogen cooling spray protect the epidermis during the treatment allowing the epidermis to be spared from injuries.
The 130 Nd:YAG laser system (CoolTouch™) can be safely used on all skin types and all year long, even in sunny tropical climates particularly for patients with light to moderate wrinkle severity.

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TWO YEARS TRIAL OF HAIR REMOVAL WITH LIGHTSHEER™ DIODE LASER SYSTEM IN DARKER SKIN PATIENTS

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The purpose of this study was to evaluate the safety and efficacy of the LightSheer™ Diode Laser System for hair removal in darkly pigmented skin types.
During the last 2 years 300 patients with Fitzpatrick skin types III-VI were treated with LightSheer™ Diode Laser System (800 nm, fluence of 20-40 J/cm²) with ChillTip™ (cold sapphire window) at 641 sites (upper lip, face, axilla, bikini line, legs, trunk and backs). Number of treatment varied from 2 to 4 treatments per site (over 90% of patients had 2 and over 75% had 3 treatments). Patients were followed by repeat hair counts and photographs obtained.
Our results show an average hair clearance of over 60% after 2 treatments at monthly intervals. Most patients treated experienced substantial (> than 70%) long-term (greater than 6 months) efficacy after 2 or 3 treatments. Rare side effects were limited to epidermal crusting and temporary hypopigmentation (5%), no evidence of persistent pigmentation disturbances and no textural changes or scarring was noted. Patients were re-treated when significant regrowth had occurred, which ranged from 1 to 3 months.
We conclude that LightSheer™ Diode Laser System at 800 nm is effective, provides a safe and confortable method for significant long-term reduction in unwanted body hair in patients with darker skin tones. The availability of contact cooling allows the delivery of higher fluences in darker skin type individuals expanding the number of patients who may be treated with this procedure.

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Non-Ablative Laser Treatment of Photoaged skin using QS 1064nm laser. David H. McDaniel MD[1,3], John Newman MD[2], Jeff Lord MD[2]
From the Laser Center of Virginia[1], Virginia Beach Virginia. The Dept of General Surgery[2], Naval Medical Center, Portsmouth Virginia. Eastern Virginia Medical Center[3], Norfolk, Virginia.
Purpose: To prospectively evaluate the clinical safety of the Q-switched Nd:YAG laser used alone (without topical carbon lotion) on types I-III facial skin for the purpose of assessing whether this treatment is effective for diminishing the appearance of photoaging.
Methods: A QS 1064nm NdYAG laser was used with 6 mm spot size and 2.5J/cm2 using single pass 30-50% overlap at 10 Hz to treat the entire face of 10 subjects. The periorbital area was covered with eyeshields large enough to overlap slightly the bony orbit. Subjects received 3 treatments at 4 week intervals. Serial photographs were taken before each treatment and 3 months after the final treatment. Blinded grading and patient diary analysis were performed.
Results: Treatment parameters were such that no purpura was reported and no wound care was needed. Some mild transient tenderness of skin and slight edema were observed in some patients. No other significant adverse events were reported and patients tolerated the procedures well with minimal discomfort during treatment. Improvement in skin texture was reported by all patients and some reduction in pore size was also reported. Wrinkle assessment and blinded photograding are pending completion of the 3 month post final treatment photographs and will be reported in detail during presentation.
Conclusions: The use of the QS 1064nm Nd:YAG laser for treating photoaged skin is a safe therapy which is well tolerated by patients with minimal side effects and no wound care. Immediately post final treatment improvements in skin texture are the dominant clinical finding. Improvement of rhytides after longer term follow-up of this non-ablative laser treatment and thermal versus biostimulative issues will be reviewed.

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TREATMENT OF PIGMENTED LESIONS AND TATTOOS WITH THE 755 nm LONG-PULSED ALEXANDRITE AND 800 nm DIODE LASERS: A CLINICAL AND HISTOLOGIC EVALUATION

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New York University Medical Center, New York, New York

PURPOSE: Examine the efficacy and safety of long-pulsed 755 nm alexandrite and 800 nm diode laser treatment of pigmented lesions and tattoos.
METHODS: 20 subjects with benign pigmented lesions and 6 patients with professional blue and black-colored tattoos were treated with both the alexandrite and diode lasers at similar yet separate sites. Each patient received up to six treatments. Comparisons were based upon lesion lightening, treatment pain, and side-effects. The alexandrite laser was calibrated with a 7 or 10 mm spot and a 5 ms pulse duration to fluences ranging from 10-28 J/cm2. The diode laser was calibrated using a 9x9 mm spot and pulse durations ranging from 5-20 ms, at fluences ranging from 10-40 J/cm². Pre- and post-treatment biopsies of selected pigmented lesions and tattoos were obtained from 3 patients.
RESULTS: Epidermal pigmented lesions were treated successfully with both the alexandrite and diode lasers. Average number of treatments needed to lighten pigmented lesions by at least 75% was 1 for the alexandrite laser and 2 for the diode. All subjects achieved at least a 90% lesion lightening and overall patient satisfaction was high. No adverse scarring or pigmentary complications occurred.
Both alexandrite and diode lasers lightened tattoos after an average of 3 treatments. Although tattoos cleared more rapidly at higher fluences, adverse reactions such as scarring also occurred at highest fluences. With the exception of radiation-port tattoos, no tattoos were completely eliminated. Side-effects included treatment discomfort, transient hyper- and hypopigmentation. Moderate tissue fibrosis developed in 2 out of 6 tattoo sites. Histology was consistent with decreased pigment as well as mild fibrosis in some of the tattoo laser-treated sites.
CONCLUSIONS: The long-pulsed alexandrite and diode lasers are effective in treating both pigmented lesions and tattoos. The alexandrite laser was excellent at clearing pigmented lesions with high patient satisfaction, while both lasers moderately lightened tattoos. Scarring at high fluences may occur with either laser system.

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QUANTITIVE MEASUREMENT OF LASER EVOKED PAINFUL SENSATIONS

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Aim: Standardised laser pain stimuli and control of physical and physiological parameters of elicited pain are necessary to investigate the possibility of developing non-painful hair removal, and skin photo-dynamic therapies.
Method: Non-contact laser diode heating with wavelengths 960-980nm, powers <20W and pulse duration from 5-300ms were used. The areas irradiated ranged in diameter from 150 2000μm. Ten healthy volunteers were used. The skin surface temperature was measured by thermography and controlled by temperature feedback. The blood flow was measured by scanning laser Doppler flowmetry.
Results: For each volunteer a high level of reproducibility of modality and degree of sensation was obtained. The surface temperature threshold for painful stimulation with duration of more than 100-150ms was 58 ±2°C. For several subjects, the threshold level of painful sensation was increased when the next stimulus was applied with an interval between 5 & 20 minutes. Statistically significant changes of blood flow were registered for painful sensations.
Conclusion: the temporal summating curve of painful skin sensations and their modulation allows for reduction of pain by increasing the pain threshold or selection of appropriate laser operating parameters.

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EVALUATING PORT-WINE STAIN PROPERTIES USING REFLECTANCE MEASUREMENTS

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Port-wine stains (PWS) are most commonly treated with the flashlamp pumped dye laser (FLPDL, 585 nm wavelength and 0.5 ms pulse duration). These laser parameters are optimal for coagulating superficial blood vessels with 40-60 μm diameter. After several treatments one can therefore expect remaining blood vessels much smaller or larger than the optimal size, and they may also be located at a depth difficult to reach with the FLPDL. Treatment with the FLPDL should then be terminated. It may, however, be difficult for both parents and dermatologists to do so based on visual appearance of the birthmark only. Therefore, this study discusses use of visible reflectance measurements as a supportive tool when evaluating the properties of port-wine stains and their outcome.
Visible reflectance spectra were measured from port-wine stain and normal skin with an integrating sphere spectrometer, from the cheek of 21 children (age 1 -14 years). The measurements were repeated 3-5 months later for twelve children. All children had received at least one treatment prior to this study. For each measurement mean optical properties were determined using a mathematical simulation model.
The results showed birthmarks with a majority of small blood vessels in 16 patients, thin lesions in 18 patients, relatively deep lesions in 11 patients and only 3 superficial lesions. The prognostic outcome for further therapy is not good for 11 patients where the remaining lesions consist of deeply located and/or small blood vessels. In 12 patients spectra were measured prior to and after laser treatment. The results indicate improvement in 5 or 6 patients, slight improvement in 6 patients, whereas for 7 patients no further treatment is recommended.
Reflectance spectra measured in the entire visible wavelength region may offer dermatologists a tool helping then to optimise the number of laser treatments with the existing FLPDL laser, for each individual child.

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IMMUNOHISTOLOGICAL STUDY OF LONG-PULSED RUBY LASER HAIR REMOVAL

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PURPOSE: Histological changes in human skin before and after exposure at the process of laser hair removal have not yet been thoroughly investigated. The aim of this study is to clarify the differences that occur immediately after laser exposure and 1 month after laser exposure by using immunohistological staining and apoptotic cell staining.
METHODS: Eight adult Japanese volunteers were recruited for this study. They were treated with a long pulsed ruby laser at 20 J/cm²A single 3 mm punch biopsy of the laser treated sites was obtained immediately following laser irradiation and at the one month follow-up visit, and they were analyzed using HE, PAM, immunohistological staining and Tunel method (apoptosis).
RESULTS: Immediately after laser exposure, hair follicles were very damaged and had extensive eosinophilic degeneration. One month after laser therapy, one type of hair follicles showed cyst-like formations with negative PCNA reactions and positive apoptosis reactions. Another type of hair follicles showed follicular mitotic figures with cytoplasmic halos. Early anagen hair follicles were apparently not effectively treated by ruby laser.
CONCLUSION: Ruby laser leads to extensive follicular damage, and hair follicles considered to be at early anagen phase were not effectively treated. This may be the reason why several courses of laser therapy are required to get satisfactory results.

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ERBIUM:YAG RESURFACING AT THE TIME OF SURGICAL CLOSURE

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There are many studies demonstrating the aesthetic benefits of resurfacing a wound six to eight weeks following surgical closure. Our study was designed to evaluate the effects of resurfacing a wound at the time of surgical closure.
Ten patients with skin types I – IV undergoing reconstruction using a complex linear closure on the face following Mohs surgery were enrolled in the study. Following closure of the wound with subcutaneous sutures and an intradermal running suture half of the wound was treated with two passes using an erbium:YAG resurfacing laser. The other half of the wound was left as a control. Both sides were treated with identical wound care.
Follow-up evaluations were performed at one week, two weeks, one month, three months, and six months. The wounds were graded by subjective evaluation, blinded photographic analysis, and profilometry analysis. Differences in texture, wound alignment, erythema, and adverse reactions were evaluated.

Although both sites healed well with good wound alignment and minimal adverse reactions, some differences were noted. This study highlighted the differences seen when resurfacing a wound at the time of closure.

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A SPLIT-FACE STUDY TO INVESTIGATE A POSSIBLE ROLE OF ERBIUM LASER IN THE TREATMENT OF ACTIVE ACNE VULGARIS.

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Purpose: To determine if the Erbium laser may be helpful as a coadjuvant in the therapy of active acne

Methods: A group of 28 volunteers with Acne vulgaris in an active stage ranging in age from 14 to 40 years underwent laser resurfacing with an Erbium:YAG laser on half of their face leaving the other half as control. Treatment was done under topical anesthesia in three monthly sessions lasting less than 5 minutes each. Underlying medical acne treatment remained unchanged. Patients on Accutane were excluded. All degrees of acne severity were represented in the study.

Results: Faster resolution of acne lesions was observed in the laser treated side in 24 of 28 patients
All patients reported to develop less lesions in the laser treated side even after the first session
Worsening of acne in the laser treated side was observed in 1 patient

Conclusions: Erbium laser demonstrated to have a beneficial effect in these patients. Treatment sessions were extremely well tolerated.

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LASER HAIR REMOVAL: RESULTS ARE NOT INFLUENCED BY DAY OF TREATMENT ACCORDINC TO MENSTRUAL CYCLE

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Introduction: Efficacy of laser treatment for hair removal is changing in different patients. We tried to find whether phase of menstrual cycle at time of laser treatment influences the efficacy of hair removal.

Methods: 18 women 24 to 48 years of age (mean/SD = 36.7/6.3 years) who had laser treatment (long-pulsed alexandrite) for hair removal (face, legs, bikini line) in our office were asked for the date of last menses' first day. All patients were divided into two groups treated either during first or second half of menstrual cycle. Result of hair removal was estimated by patients using a rating scale between 1 and 5 (1 = excellent), by doctors assessing the appropriate hair loss according to pretreatment picture, by noting the weeks of being hair-free and by calculating weeks of duration till patients came for next treatment. Statistical analysis was done using the nonparametric U-test (Mann-Whitney).

Results: Comparing treatment during first or second half of menstrual cycle there was no significant difference neither by patient's ($p = 0.523$) nor by doctor's ($p = 0.129$) estimation of result, time of being hair free ($p = 0.805$) and passed time ($p = 0.929$) till patients came for next treatment. Statistical evaluation revealed no difference comparing data after first or second treatment.

Conclusion: There seems to be no difference in the probability of hair loss after laser treatment weather patients are treated during the first or second half of their menstrual cycle.

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RESPONSE OF ELASTOSIS PERFORANS SERPIGINOSA TO SHORT PULSED CO_2, Er:YAG, & PULSED DYE LASERS

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A 17 year old Caucasian man presented with histologically-proven elastosis perforans serpiginosa (EPS) unresponsive to tape stripping or cryotherapy. Three annular plaques were located on the neck. The right sided plaque was treated with CO_2 laser (3 mm, 350 mJ pulse energy, 3 passes with post-pass debridement) and the left sided plaques with Er:YAG laser (2-3 mm, 20 J/cm^2, 4 passes without debridement). Wound care consisted of cleansing followed by bacitracin zinc ointment TID til re-epithelialized. Biopsy specimens obtained immediately after treatment revealed epidermal and dermal tissue removal with residual thermal collagen damage consistent with the wavelength used as well as epithelium-bound elastin fibers still present within the dermis. Six weeks later clinical recurrence was evident at all sites. Five weeks later, a second treatment at the same laser settings was carried to 4 passes for CO_2 and 6 passes for Er:YAG. Again histologic sections of post-treatment specimens showed deeper injury, but elastin fibers yet present within the dermis. Six weeks later, the CO_2 site showed a 50% clinical response, but some textural scarring; and the Er:YAG site 20% improvement. All three plaques were then treated with pulsed dye laser (PDL - 585 nm, 0.45 ms, 7 mm, 7.0 J/cm^2) in minimally overlapping pulses. Examination four weeks later demonstrated no further clinical improvement. Clinical results in this patient suggest a partial benefit in EPS lesions from resurfacing well into the papillary dermis, but no benefit from PDL.

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ULTRASOUND STUDY OF THE DEPTH OF PORT WINE STAINS

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Pulsed dye laser treatment (PDL) of congenital capillary malformations, so called port wine stains (PWS), have varied between excellent to poor. Some studies have demonstrated

better results in certain anatomic locations. The purpose of this investigation was to study the depth of untreated PWS on 55 patients with a high resolution 20 MHz ultrasound.
Of those PWS that were measurable (45/55), the mean depth was 1.00 mm (±0.5 S.D., range 0.2-3.7mm). 10 PWS were not measurable, probably because they were too superficial or too thin a calibre of the vessel. Clinically they were geographic and pale. PWS involving areas that respond poorly (central face, dematome V2 and the extremities) to PDL treatment were in average 0.14 mm deeper than PWS involving good responding areas (lateral face, forehead, neck, trunk and shoulder)that had a mean depth of 0.94 mm. Lesions located on the head were deeper with a mean depth of 1.08 mm (± 0.5 S.D.), whereas lesions on the trunk were more superficial. The intra-PWS variability was 0.5 mm or less within 3 different parts of the lesion in 3/19 PWS. A variation of only 0.1 were seen in 7/19 PWS. A tendency towards more spreading within the PWS with age were seen.
Ultrasound is a non-invasive tool that can help to characterize the PWS in the majority of the patients and may help to predict the outcome of PDL treatment. The depth is not the only and not the main parameter that is responsible for treatment response. Some PWS may fail to respond on the basis of their vessel diameter or the rate of blood flow through these lesions or because of some other today unknown factor.

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COMPARISON OF 1064NM LASER SYSTEMS FOR TREATMENT OF LEG TELANGIECTASIAS

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Use of a long pulse (milliseconds) 1064nm laser has been shown to permit treatment of leg veins up to 3mm in diameter. A new 1064nm laser device has recently been developed utilizing dynamic cooling and sequenced pulsing allowing millisecond domain pulsing. The new laser device adds dynamic cooling which is variable from 10 – 45 msec and can be delivered both prior to and following the laser pulses. The purpose of this study was to evaluate results from the new dynamically cooled laser system compared to the original 1064nm system delivering a single pulse of 16 millisec with contact cooling. Fifteen patients with similar thigh telangiectatic webs (0.5mm to 1.5mm) were enrolled in the study. Digital images of all sites, size of the vessels and patient assessment of comfort were recorded. Bilateral treatment by 1064nm laser was performed using a 16 msec pulse at 120-140 J/cm2 with contact cooling at 1.5 degrees C on one side and a 60 msec pulse (comprised of a train of 6 pulses) at 120-150 J/cm2 total fluence on the other side. Clinical outcomes were judged at one month post-treatment as either improved, no change or worsened. The treating physician and one blinded observer compared the pre- and post- treatment images as well as vessel size. Results were 11/15 sites with a single 16msec pulse improved, 12/15 sites of dynamically cooled pulse train were improved. Incidence of matting was 3/15 sites with single pulse contact cooling and 1/15 sites with dynamic cooling. Hyperpigmentation was similar between the two groups (13%). Patient comfort rating was significantly improved with dynamic cooling. We conclude that different methods of delivery of 1064nm laser are equally effective. Patient comfort is slightly increased with dynamic cooling. Trends for side effects indicate an overall reduced rate with cooling.

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NONABLATIVE DYNAMIC CRYOGEN SPRAY COOLED LASER TREATMENT OF FACIAL ACNE SCARS

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Cryogen spray cooling has been shown to be a safe and effective method for protecting the epidermis during nonablative laser treatment of facial rhytides. We believed that acne scars could possibly be improved using the technique of spatially selective thermal injury of the upper dermis with epidermal sparing by dynamic cryogen spray cooling and monitoring of peak epidermal temperatures. The objective of this pilot study was to determine the efficacy and safety of cryogen spray cooling in combination with a nonablative Nd:YAG (lambda = 1320 nm) laser treatment of facial acne scars consisting of moderate pitting and small crater-like depressions. Ten human volunteers with bilateral acne scarring were treated with dynamic spray cooling (20 – 30 msec) in combination with 3 nonablative laser treatments performed sequentially at intervals of 4 weeks utilizing fluences of 30 – 35 J/cm2 achieving a peak surface temperature of 42 – 45 °C. Photographic assessment at 4 weeks after the final treatment indicated small improvements in the flattening of scars and textural improvement. Assessment performed 12 weeks after the last treatment showed approximately 25% improvement by patient self-assessment and clinical photography. Side effects were minimal; no pigmentation changes were noted even in the 2 African-American patients. One patient developed a vesicle on the lateral cheek that subsequently led to a slightly depressed scar. This pilot study indicates that dynamic cooling is a safe and effective method for protecting the epidermis during nonablative laser treatment of facial acne scars that can be performed regardless of skin color. Larger studies with optimization of treatment parameters may further improve these initial encouraging results.

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DETECTION OF DYSPLASIA AND MALIGANCY IN ORAL MUCOSA UNSING AUTOFLUORESCENCE. P. Wilder-Smith, A. Ebihara, L.-H. Liaw, T.B. Krasieva, D. Messadi (Beckman Laser Institute and Medical Clinic, University of California, Irvine; University of California, Los Angeles).

Objective of this investigation was to investigate laser-induced autofluorescence using several wavelengths of excitation and detection for non-invasive detection, diagnosis of oral dysplasia and carcinoma. Light exposure of cells and tissues in the visible and UV range results in excitation of naturally occurring fluorophores. Deactivation occurs in part via fluorescence emission. Standard DMBA carcinogenesis was applied to 1 cheek pouch in 20 Syrian golden hamsters for 0, 4, 6, 8, 10, 12, 14, 16, 18, 20 weeks respectively. Best results were obtained using excitation at 405nm, with detection at 470nm. A significant reduction in autofluorescence intensity was observed with the onset of histological early dysplastic changes. Further reduction in autofluorescence intensity levels by approx. 30% was observed in squamous cell carcinoma. The progression of histological and fluorescence changes differed significantly between animals ($p<0.05$). Thus, laser-induced autofluorescence may provide a

novel, sensitive, non-invasive tool for the early detection and diagnosis of oral dysplasia and malignancy. Supported by the Culpeper foundation, TRDRP 71T-0192, NIH (LAMMP) RR01192 and DOE DE903-91ER 61227.

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RECALCITRANT MOLLUSCUM CONTAGIOSUM: TREATMENT WITH CO_2 LASER, TRICHLOROACETIC ACID AND PULSED DYE LASER

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Lesions of molluscum contagiosum in patients with AIDS are usually numerous, widespread, recurrent and difficult to treat. We present a case successfully treated by a combination of CO_2 laser, trichloroacetic acid (TCA) and the 585-nm pulsed dye laser (PDL).

The purpose was to determine the effectiveness and ease of the CO_2 laser and the PDL treatment of recalcitrant molluscum contagiosum. A 22-year-old man, with HIV infection detected in 1990, presented with widespread lesions,predominantly located on the face,since 1995. The facial lesions were treated with the CO_2 laser. It was used in a continuous wave of 10-20 watts for the large lesions, and 5-10 watts for the smaller ones. One month later, some lesions started to recur. They were fewer and smaller than the ones before laser treatment, and we treated them either with 50% TCA or with the PDL. The PDL was also used to treat lesions located in the axillae, at 7.5 J/cm^2 in double pulses. These lesions resolved completely in one week, after one treatment.

The final cosmetic result was considered excellent by the patient and the physicians. No hypertrophic scars or discromias were observed and the patient was able to reassume all his social activities. Although recurrences are frequent, the combination of two or more therapeutic modalities, such as CO_2 and pulsed dye laser, can be of great help to improve the quality of life of these patients.